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Aug. 25th. 1919

Dear Sir,

Herewith the observations and notes on the Brazil nut trees in our gardens. The observations regarding the exocarp whether persistent or not, the operculum falling in or out have been postponed till I get a ripe nut fruit.

Des.

Yours respectfully.

C. B. Deshmukh

To,

The Director of Gardens. Singapore.

M. Deshmukh, Can you not furnish this now by getting a ripe fruit -  
Keep it until then please.



The Brazil nut tree in Singapore.

*The Brazil nut*, One of the biggest and the evergreen trees of the Amazon valley -- according to Pater -- was introduced in <sup>the Botanic Gardens</sup> Singapore in 1881 in the Botanic Gardens and finally transferred to the Eco. Gardens in 1884 where they are growing just at present. Only two plants <sup>from the Royal Botanic Gardens, Kew</sup> were received from R.G., Kew, and they ~~are~~ <sup>are now fine specimens</sup> of what may be called the biggest and the tallest of the trees of the Tropics. Two further introductions were made in 1885 and 1887 from Trinidad and R.G., Kew respectively.

Out of these introductions, there are only three trees ~~growing~~ growing, one opposite to the Tamil Coolies' Line and the other in two (near the Clerk's quarters) those from time to time reported to be making good progress and producing fruit from 1901 onwards steadily each year.

The article by Mr. Patch in the Annals of the R.G., Ceylon, has aroused some interesting discussion as to the true nature of the species yielding the Brazil nut of commerce.

"The Brazil nut of commerce is usually said to be produced by the species of Bertholletia Erodia. The genus Bertholletia was established in 1808 by Humbolt and Bonpland for the single spp. B. excelsa, and it was stated by the author that the Brazil nut of commerce ~~was~~ was the seed of the spp. Miers, in the Trans. of the Linn. Society, held that there are two <sup>species</sup> spp. and the Brazil nut of commerce is obtained from <sup>the new one</sup> B. nobilis and not from B. excelsa. Young has discussed the question and says that from the examination of the fruit that the ~~view~~ <sup>view</sup> taken by Mr. Miers is correct.

*Peter opposes it.*

The following notes <sup>have been made in an attempt to</sup> ~~are given with view to see to which of~~ <sup>ascertain the position of the Singapore trees</sup> ~~the two spp. the Singapore trees belong.~~ <sup>as regards to the controversy.</sup> The principal points of their difference are as under:-----

B. excelsa, Humb and Bonp.	B. nobilis Miers.
Tree, high 100ft. or more high with the stem diam. 2.5 to 3ft.	tree taller, stem diam 14 ft.
Leaves green, petioles 9-18 m.m. long	vs. <del>xxxx</del> rufescent, petioles 3--6 m.m. long
Inflorescence 8 in. long with single branch	



$$\begin{array}{r}
 81 \\
 \times 12 \\
 \hline
 162 \\
 810 \\
 \hline
 972
 \end{array}$$

$$\begin{array}{r}
 203 \overline{) 9600} \quad 47.3 \\
 \underline{406} \\
 5540 \\
 \underline{1118} \\
 4352 \\
 \underline{870} \\
 3582 \\
 \underline{716} \\
 2866 \\
 \underline{573} \\
 2133
 \end{array}$$

$$\begin{array}{r}
 12.7 \overline{) 54.00} \quad 4.25 \\
 \underline{254} \\
 2860 \\
 \underline{508} \\
 2352 \\
 \underline{470} \\
 1882 \\
 \underline{376} \\
 1506 \\
 \underline{312} \\
 1184 \\
 \underline{236} \\
 948 \\
 \underline{189} \\
 759
 \end{array}$$

$$\begin{array}{r}
 65 \times 12 = 780 \\
 780 \div 20.7 = 37.68
 \end{array}$$

$$\begin{array}{r}
 20.7 \overline{) 780.0} \quad 37.68 \\
 \underline{414} \\
 3660 \\
 \underline{714} \\
 2946 \\
 \underline{589} \\
 2357 \\
 \underline{471} \\
 1886 \\
 \underline{377} \\
 1509 \\
 \underline{754} \\
 750
 \end{array}$$

$$\begin{array}{r}
 7800 \div 20.7 = 376.81 \\
 7800 \div 20.7 = 376.81
 \end{array}$$

$$\begin{array}{r}
 7560 \div 20.7 = 365.22 \\
 7560 \div 20.7 = 365.22
 \end{array}$$

The results of the analysis of the soil samples are as follows:  
 The soil is a light brown loam, containing a large amount of organic matter.  
 The pH is 6.5, which is slightly acidic.  
 The soil is rich in nitrogen and phosphorus, but deficient in potassium.  
 The soil is well-drained and has a high water-holding capacity.  
 The soil is suitable for growing most crops, but it is best suited for growing crops that require a high amount of nitrogen and phosphorus.  
 The soil is also suitable for growing crops that require a high amount of potassium.



Inflorescence 8 in long with <sup>a</sup> inflo. 10 in long with about  
single branch nearly equal in five ~~xxxx~~ branches shorter and  
length and one-sixth in nodes ~~.xxxxx~~ .25 to .5 in apart  
internodes, Fruit approximately spherical,

Fruit slightly elongated, ~~xxxxxxxxxxxx~~ usually 4 or 5 in.  
~~xxxx~~ 6 in. in length.

Cortex of fruit thick and rough  
Cortex of fruit smooth, palish, ~~xxxxxxxxxxxx~~  
entire and persistent. darker and cracking as the

Opercular opening with fruit dries and peels off as the fruit  
is handled.

straight walls or concave Opercular opening with sharp  
narrowing slightly at the inner end. edge and concave walls ,

Operculum cylindrical with widening considerably inwards.  
roundish indented apex. operculum oval or radially

Operculum breaks away and falls compressed, conical and pointed  
from the fruit as the neck at the apex.

shrivels. Operculum remains attached to  
the remnant of the columella.  
and as the latter shrivels  
falls into the cavity of the  
fruit.

*Blind*  
The nature of the soil on which the trees grow is of stiff  
clay formation and slopes downwards ~~cap~~ one side. Those by the side  
of the quarters are in the vicinity of the flooded area and are  
shaded on the east ~~side~~ side by a big tree --- *Eriodendron Anfractuosum*.  
Because of the fact that trees grow within five feet of each other  
they are unevenly balanced on the trunk and bear branches on the  
exposed side only. ~~they have been killed by the flood.~~

The one opposite to the T.E.L. is, <sup>growing</sup> though ~~growing~~ in the cluster  
of ~~xxxx~~ tall trees such as *Eugenia grandis*, *Cyrtophyllum fragrans*,  
*Ficus benjamina*, etc. still it has produced a nice cone like head,  
and has branches all along the stem from nine ft. upwards.

In all ~~x~~ cases above noted the trees have drooping branches



branches in the lower half of the trunk and their heights are thus:--

1-2( c.Q).                      3.( T.C.L.).

25-30 ft.                      9'-4".

The upper branches are directed towards the sky; while the lower ones, ~~the~~ earthwards.

MR. Ridley had recorded the progress of ~~these~~ two trees ten years ago and mention has been made of the growth ~~of the growth~~ in the Bot. Gardens' annual reports and in the Agri. Bul. and they stood thus that time:----1909.                      the Measurements in 1919 are as under. :--

	Big.	Small.	B	S	T.C.L.
Hgt.	65ft.	63ft.	1	2	3.
			83ft.	80ft	45 ft.
Girth,	<del>5 1/2"</del>	<del>2 7/8"</del>		nearly.	
3' from	20.7	19.8	7 1/2"	5 1/4"	3 1/4".
ground	38.8	77.1!	27.3	20.3.	12.7
Ratio of diam. to hgt.			36.4	47.3	42.8
	<del>11.0</del>	<del>11.0</del>	<del>18.7</del>	<del>18.7</del>	<del>13.8</del>

The ratio of hgt. to ~~diam.~~ <sup>ci.</sup> in B. excelsa is , According to Miers, is 40:1 to 33.3:1 and in the B. nobilis 8.6: 1. All our trees in the Gardens show the ratio somewhere about the B. nobilis except the one measured in 1909 smaller tree; but the measurements now show a ratio much less and hence approach much more in stature to B. nobilis than the other spp. Moreover, Miers state s that the trunk of B. ~~is~~ is bare to a great height, and our two trees do show the same trait except that opposite <sup>to</sup> the T.C.L. This may be due to the difference in situation.

The average length of the leaf of the trees (all) is 10.9 " the breadth, is 4.1". ( I have measured leaves upto 15 "long). The petiole is 28 m.m. long average and has wings ~~2~~ 2-3 m.m. It is twisted .

The young lvs. develop dark green color from pale brown. The Pairs of nerves range ~~from~~ upto 30 according to the size of the leaf. The margin of the leaf is indistinctly serrate and the outline of the leaf wavy.

From the leaf characters , the trees may be referred to/ B.E.



The branches and the twigs have conspicuous scars left on them on the fall of the leaf and they are much lenticulated.

The centrifugal inflorescence is in all cases a terminal panicle 10.5" long with from 2-6 side branches 7.75" long all shorter than the main rachis, arising at a distance 0.5". The axes are markedly terrate and bear solitary flowers with pedicels 4-5m.m. long. These sub-branches are at an angle of 30-45° to the main axis and then become parallel after the <sup>fashion</sup> ~~branching~~ of the *Castiela elastica* ~~axes~~. branches. The bulk of the inflorescence is at the top of the tree while scarcely or none ~~it~~ can be seen on the lower branches. The characters, according ~~xxx~~ to Miers, are mixed B.E. and B.N. ~~Thatxxxxxxx~~ The inflorescence is spreading and has horizontal side floral branches while that of B.E. has one branch ~~and it takes~~ ~~xx xxxxx~~ ~~xxxx~~. Flowers range from 25-90 in no. on the axis.

The flowers are sometimes found arranged in whorls or in spirals. The former arrangement is not found in all cases. The floral bracts are three in no. the two sideways and the biggest is anterior to the axis. These are caudaceous and fall off soon after the young buds develop. The smaller ones are strongly keeled, and all are softly pubescent.

The floral formula stands thus:--

Zygo.	K.	C.	A.	G.
	2	6		$\frac{7}{1}$



Two concave sepals, one smaller than the other are of pale green colour, softly pubescent and have 3 dentations at the top—a character fairly common though in a few cases only two have been observed. This is a ~~xxxxxxxxxxxx~~ *excelsa* character. The sepals are ciliate.

The corolla consists of 6 petals ~~very~~ recurved at the top, pale cream, and remain attached to the androphorum and drop ~~very~~ soon after the flower falls off the tree. No fragrance.



There is a big structure called androphorum which carries modified stamens at its top and fertile ones at the bottom arranged <sup>which</sup> around the hole through the style projects. This is always seen rolled upon the fertile stamens and thus ill spares the cross-fertilisation by the insects though a few insects what may be called either flies or bees were noticed on the top inflorescence (The height of the ~~fixxxxx~~ inflorescence is too high for close observation).

The style is  $1\frac{1}{2}$  times higher than the stamens ~~and~~ but falls a little flat on the stamens owing to the pressure of the androphorum. and a slight movement of the rachis will <sup>cause</sup> cease direct contact with the anthers. Anthers are held on the top of the the filaments and are <sup>with</sup> introse and lateral dehiscence.

The ovary is 4-5 celled (the latter found only in one case examined). with 4-6 ovules arranged on the central axis which ~~for~~ as the columella at the top of which is seen the operculum in the fruit stage.

The fruit which has been made the main basis on which the separation of the spp. relies--- it gives fairly constant characters <sup>probably</sup> ~~because of~~ the self-fertilisation ~~probably~~--- is a spherical, brown skinned, much lenticulated dry indehiscent ~~fruit~~ the fruit in section and its dimensions:-----

The pyxidium has a diameter of 5.97" (circum. 20.5 in.) with the exocarp, 12-22m.m. thick, mesocarp, 12-15m.m. very woody and hard, endocarp, a thin membrane like thing. At the top of the fruit is a sharp point in a depression and there is a deep cut groove around it a few in <sup>ches</sup> down.

On cutting open the fruit, the operculum can be seen and got out of the the opening. The opercular opening is ~~the~~ one of the points of the separation of the spp. Here it is a

